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The divergence of the new and the old mechanics occurs only for actions of separate electrons, of unattainable velocities, of energy existing in the chemical atom, and of radiant energy in empty space unassociated with matter. Now there are many men of science who think these problems are metaphysical, in that they do not deal with measurable bodies or with phenomena capable of experimental verification. And there is a great likelihood that problems of such a nature are incapable of scientific solution and are apt to drift into a discussion more of definitions and of words than of objective facts.

The warning which was given by Poincaré, shortly before he died, is one to be heeded by the over-zealous.

If, however, in some years, its rival (the new mechanics) triumphs, I shall venture to point out a pedagogic error that a number of teachers, in France at least, will not escape. These teachers will find nothing more important, in teaching elementary mechanics to their scholars, than to inform them that this mechanics has had its day, that a new mechanics where the notions of mass and of time have a wholly different value replaces it; they will look down upon this lapsed mechanics that the programs force them to teach and will make their scholars feel the contempt they have for it. Yet I believe that this disdained classic mechanics will be as necessary as now, and that whoever does not know it thoroughly can not understand the new mechanics.

LOUIS T. MORE

UNIVERSITY OF CINCINNATI,  
December 3, 1913

#### GEORGE WESTINGHOUSE

My acquaintance with Mr. Westinghouse commenced in the spring of 1867 in Pittsburgh. He was at that time introducing to the railroads a patent car replacer and a double-headed railroad frog, both of his invention. These were being manufactured by Messrs. Anderson, Cook & Company, crucible steel manufacturers, I being employed by the same company. He was doing the selling—at the same time making his first acquaintance the same way as his more universal law of gravitation is accurate for ponderable bodies but fails for intangible molecular bodies.

with railroad men, so valuable to him in later years. We lived at the same hotel and later on, after we were both married for about a year, we lived in the same house on Penn Avenue, next door to where the great Westinghouse Building now stands, and, being of congenial tastes, our acquaintance ripened into a warm friendship which continued up to the time of his death.

During this time he often talked of the idea of operating the brakes of a railroad train by compressed air, one of the greatest advantages of which he thought would be the putting of the full control of all movements of the train into the hands of the engineer. He had witnessed a collision between two trains and saw the necessity of some better apparatus for controlling their speed than what was then in use. Not having the money to pay the expense of the first equipment, which only amounted to \$750, he gave a very substantial interest in the patent to one of the men who was afterward associated with him, in return for the necessary capital. This gentleman made over \$2,000,000 out of this interest in the Brake Company within the next twenty-five years.

He soon had all the details of the new invention worked out and the first train equipped. It was first tried on an accommodation train on the P. C. & St. L. Railroad, running west from Pittsburgh. It was a success from the very first, preventing a bad wreck and probably saving several lives within a week after its installation.

A company was soon formed and the manufacture of the brakes was commenced within a few months. He added from time to time improvement after improvement until in 1886 he brought out the automatic quick-action brake. The greatest rival of the air brake at that time was an electric brake. After studying this problem for some time, Mr. Westinghouse announced to his associates that he had conceived the idea of an improvement in the air brake that would make its operation quicker than the electric. No one could understand how this could be true, but when the brake was constructed and put in operation they found it was a fact.

The results of the working of this improvement proved that it was very much superior to the older form and that his claims were correct. The company then equipped a 50-car train with the improved apparatus. This was taken all over the continent from Boston to San Francisco, giving exhibitions at different points.

This settled the question beyond any doubt as to which was the best brake, and nothing more was heard of the electric brake, until the latest invention by Mr. Westinghouse within the last few months of the electric pneumatic, which is, as its name implies, a combination of the use of electricity and air pressure.

He early turned his attention to railroad signaling and was the father of the modern automatic signal, first using compressed air and later electricity and a combination of both.

The inventions of Mr. Westinghouse have done more for the safety of the railroad traveling public than those of all other inventors that have ever lived. People who travel will never know how much of a debt they owe for their safety to him. The fact is that to-day the safest place for a man to be is on a railroad train. This is proved conclusively by the fact that accident insurance companies pay double the face value of their policies if the death of the insured occurs on a public conveyance.

I think that the invention and development of the air brake was Mr. Westinghouse's greatest work. It certainly has done more in saving lives and making travel safe than all other inventions put together. The present generation can never know how much it means to them, but they will remember the name of Westinghouse more in connection with the air brake than anything else.

Mr. Westinghouse was quick to grasp the possibilities of any great invention or enterprise. This was shown in his development of the use of natural gas in Pittsburgh. The iron manufacturers of Allegheny County had been watching the use of this wonderful fuel by one mill for 15 years, all of them saying that it could be only temporary and would soon give out. After Mr. Westinghouse's

attention was called to it and he began studying the subject, he made up his mind that the supply of natural gas was immense and would last long enough to warrant the organization of a large company for its development and distribution. He, therefore, organized the Philadelphia company and in a few months had Allegheny County literally ablaze with the gas from many wells and was supplying the mills and private residences with the new fuel at a price which saved them millions of money besides paying handsome dividends to his stockholders.

To him more than any one else in this country is due the development and introduction of the alternating electric current. The story of its introduction in this country is well known, having been told by better pens than mine. The extent and magnitude of his electric and machine works far surpass any of his other enterprises. At the time it was built the floor space covered by the British Westinghouse Works at Manchester in England was as much as the combined Westinghouse electric works and the Westinghouse machine works in East Pittsburgh.

George Westinghouse had unlimited faith in himself and he had the courage of his convictions. He never asked his associates or the public to invest in anything in which he would not risk his own money. All of his stockholders could be dead sure of always having a square deal from him.

A frenzied financier once made a proposal to him which involved the sale of a company whose stock he controlled. The scheme as proposed by this man was that the stockholders were to get one price for their holdings while Mr. Westinghouse was to receive a much larger price for his. His reply was one of the most indignant, scathing and cutting letters that I have ever read and must have been anything but pleasant reading to the receiver.

It is given to very few men to be responsible for the creation of such great enterprises as those which were founded by Mr. Westinghouse, and he was justly very proud of them and of what they had done—but more than all else

for what they had done for humanity, especially in the introduction of the air brake.

We who knew him best were very proud of him and could not but love him, and for that reason we could have wished that he had devoted less of his time and energy to his enterprises in Europe and more to those on this side of the Atlantic. He would have had very much less worry and more peace of mind and comfort during the last few years.

He had a dream of seeing all of Great Britain's system of railways electrified. He thought the time had arrived when it could be done. This was his reason for the erection of the great works at Manchester, but he was a little ahead of the times. England is an ideal country for such a possibility, a network of railways, an immense number of short light trains, and coal mines so near that it would be quite within the range of developed possibilities of to-day to have the electric current generated by gas engines at the mines and distributed all over Great Britain by the high-tension electric system. None of the lines would have to be more than 200 miles long, most of them much less.

There are several schemes to erect monuments to the memory of Mr. Westinghouse. There can not be too many, or too costly; but after all the greatest and grandest monuments are the ones he built himself—the great works all over the world employing some sixty thousand workmen and two hundred million dollars capital.

Mr. Westinghouse was in every sense a thoroughly practical man. He knew how to manage men and how to handle tools with his own hands. In going through his great shops with him I have many times seen him stop and show the workmen that what they were doing was wrong, and then he would take hold and show them the right way. Workmen always respect such an employer.

He cared little for music, art or amusements. His favorite recreation was the working out of some new mechanical problem. Many a night after spending the evening with his guests I have known him to work until the small hours

of the morning with pencil and paper over some new idea that had come to him.

He was given many honors both at home and abroad—among the principal ones are the Legion of Honor of France, The Royal Crown of Italy and the Leopold of Belgium. He has been awarded the John Fritz medal and the Edison medal, and just lately the Grashof medal from Germany. He was honorary member and past president of the American Society of Mechanical Engineers, and honorary member of the American Association for the Advancement of Science.

He was one of the most lovable of men, always the same, a perfect gentleman. He was the soul of honor. His private life was pure. His honesty and integrity were unquestioned. During an intimate acquaintance of 47 years I never heard from any one any statement that reflected in any way upon his honesty or his upright character. I think without question he will go down through history as a peer for high character among business men of his time. His home life was ideal. His good wife was never forgotten either when he was at home or when absent, and every evening at a pre-arranged time, unless the ocean separated them, the telephone was always brought into use for their evening greetings. He was preeminently a true and devoted husband to his dear wife and a loving father to his idolized son. His family and all of his friends will feel their loss in his death more and more as the years go by and they will realize that never in this life will they find his equal.

S. T. WELLMAN

CLEVELAND, OHIO,  
April 6, 1914

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*BIOLOGICAL STATION WORK AT THE UNIVERSITY OF WISCONSIN*

THE University of Wisconsin will open its biological station to investigators from June 15 to October 1, 1914. During the regular university summer session, courses will be offered in general zoology, general botany, heredity and eugenics, evolution, field zoology, teaching of zoology, dendrology, morphology of algæ,